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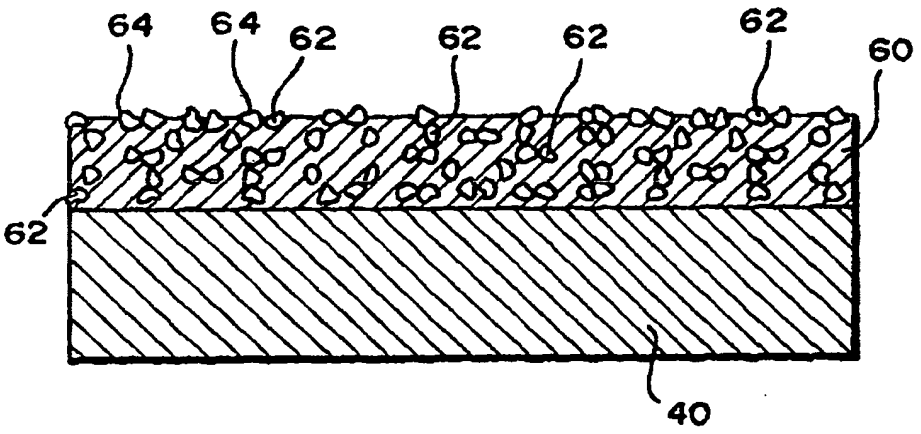
(54) Title: WEATHERSEAL HAVING A CONTACT SURFACE WITH CROSS-LINKED PARTICLES



(57) Abstract

A weatherseal (20) is disclosed having an elastomeric substrate (40) within a contact layer (60) including a multitude of cross-linked particles (62) in a thermoplastic. The cross-linked particles (62) are distributed throughout the contact layer (60) and result in a multitude of projections in the contact layer (60) to define a reduced area of contact with a panel, such as a glass panel.

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WEATHERSEAL HAVING A CONTACT SURFACE WITH CROSS-LINKED PARTICLES

Field of the Invention

The present invention relates to a seal for releasably contacting a panel, and more particularly, to a weatherseal for releasably contacting a glass panel in an automobile, wherein the weatherseal includes a contact surface with a reduced coefficient of friction for allowing the glass panel to be smoothly moved into and out of contact with the weatherseal, while reducing passage of water or air between a seated glass panel and the weatherseal.

The present invention further relates to glass run channels, and more particularly, to a glass run channel having a thermoplastic elastomer substrate and a thermoplastic contact layer, wherein the contact layer includes a multitude of cross-linked particles bonded to and dispersed throughout the thermoplastic contact layer.

Background of the Invention

Many vehicles employ windows formed of glass panels, wherein the window is moveable relative to a portion of the vehicle. A common construction includes the use of a glass panel in a door, wherein the door and the glass panel move relative to the remainder of the vehicle, and the glass panel moves relative to the door. In this construction, the glass panel is frequently moved between an open position and closed position with respect to the door and/or a portion of the vehicle frame. Increased business transactions such as restaurant, banking and pharmacy services are now regularly offered in a drive-through format. These transactions require the repeated release and engagement of the glass panel and vehicle. The repeated opening and closing of the glass panel places significant stress on the seal between the glass panel and the vehicle.

Traditionally, a weatherseal is employed at the interface between the glass panel and the vehicle door and/or the vehicle. The interface between the weatherseal

and the glass panel must be sufficient to substantially preclude the penetration of water and air along the periphery of the glass panel, while still permitting ready engagement and disengagement of the glass panel without requiring significant force.

Conventional sealing structures include a soft synthetic resin or synthetic rubber. However, such weatherseals do not provide for the ready opening and closing of the glass panel relative to the seal. Further, a large force is often loaded on the window glass thus resisting opening or closing of the window glass.

Prior weatherseals often employed a fiber flocking such as polyester on the area in which the weatherseal contacts the glass panel. However, the flocking process is very complicated. The complex manufacturing process adds to the cost of the weatherseal. Further, the flocking is relatively easily removed or worn away. As the flock is worn from the weatherseal, the loading force substantially increases.

Therefore, the need exists for a weatherseal that has reduced force requirements for moving a glass panel into and out of engagement with the weatherseal. The need also exists for a weatherseal having enhanced wear capabilities. A need also exists for a method of forming a low friction weatherseal.

Summary of the Invention

The present invention includes a weatherseal having a substrate and a contact layer, the contact layer including a multitude of cross-linked particles in a thermoplastic. The cross-linked particles may be distributed throughout the thermoplastic of the contact layer. In one configuration, cross linked ultra high molecular weight polyethylene particles are entrained in a thermoplastic, which is then disposed onto an elastomeric substrate.

The present weatherseal provides a reduced coefficient of friction upon engaging the panel and provides resistance to migration of air and water between the weatherseal and the panel. In addition, the present weatherseal reduces the generation of noise upon relative motion between the weatherseal and the panel.

Brief Description of the Drawings

Figure 1 is a perspective view of a first weatherseal configuration.

Figure 2 is a perspective view of a second weatherseal configuration.

Figure 3 is a perspective view of a third weatherseal configuration.

Figure 4 is a cross-sectional view showing a contact layer of the present weatherseal.

Detailed Description of the Preferred Embodiments

The present invention encompasses a weatherseal 20 for releasably and sealingly engaging a panel. It is understood the panel may be any of a variety of materials such as, but not limited to, glass, plastics, composites or metal, which may be coated, painted, surface treated or bare. Therefore, the panel may include glass such as windows and metal or composites such as vehicle body parts.

The weatherseal 20 of the present invention includes a substrate 40 and a contact layer 60 disposed on a portion of the substrate. Preferably, the contact layer 60 is disposed on those portions of the substrate 40 intended for contact with the panel.

The substrate 40 forms a base for the contact layer 60 and may be any of a variety of materials. The substrate 40 may be a thermoplastic, thermoset or a combination of thermoplastic portions and thermoset portions. A preferred thermoplastic material includes thermoplastic elastomers or olefinic TPEs. The combination of materials in the substrate 40 may be a selected to provide desired rigidity and softness for various sections of the weatherseal 20. Additionally, the substrate 40 may include a reinforcing structure 42 such as a metal carrier, wire or thermoplastic material. The substrate 40 may have any of a wide variety of cross-sectional profiles. For example, the cross-section profile may be generally "U" shaped, "J" shaped, "L" shaped or planar.

The contact layer 60 is formed of a thermoplastic resin with a multitude of cross-linked particles 62 carried therein. The contact layer 60 may have any of a variety of thickness, as dictated by the intended operating environment. For example,

the contact layer 60 thickness may be from approximately 40 microns to approximately 1,000 microns. It has been found that for increased flexibility of the weatherseal 20 a reduced thickness of the contact layer 60 is advantageous. The thermoplastic resin of the contact layer 60 may be any of a variety of materials such as olefinic materials including polypropylene or polyethylene with high melt flow index. It is understood that fillers, binders or other additives may be included in the resin. Preferably, the thermoplastic resin of the contact layer 60 is selected to bond to the material of the substrate 40 without requiring secondary adhesives may be employed.

The cross-linked particles 62 are dispersed throughout the contact layer. Preferably, the cross-linked particles 62 are sufficiently bonded to the thermoplastic material of the contact layer 60 to substantially preclude any unintended separation. Although supplemental adhesives however, it is understood secondary adhesives may be employed, it is preferred that the thermoplastic resin and the cross-linked particles 62 be selected to bond to each other without the need for a supplemental adhesive. The cross-linked particles 62 may be any of a variety of materials that have no melting point. That is, the cross-linked particles 62 degrade or disintegrate, rather than melt upon the application of sufficient heat. Typical materials for the cross-linked particles 62 includes cross-linked thermoplastics.

In a preferred configuration, the cross-linked particles 62 in the contact layer 60 are ultra high molecular weight polyethylene, which has been cross linked prior to mixing with the thermoplastic resin in the contact layer 60. Further, the ultra high molecular weight polyethylene resin may be cross linked by radiation treatment prior to mixing with the thermoplastic resin as is known in the art. Satisfactory molecular weights of the cross-linked particles 62 have ranged from approximately 3 million to 5 million. Upon being cross linked, the ultra high molecular weight polyethylene does not exhibit a melting point, and upon heat will not change its phase, and upon sufficient heat will deteriorate or degrade, rather than melt.

The cross-linked particles 62 may have a range of sizes. Typically, the particles are from approximately 10 microns to approximately 120 microns. The actual size of the cross-linked particles 62 depends upon the intended use. It is understood that a distribution of particle sizes may be employed. Alternatively, a single substantially uniform size of particle may be employed. The contact layer 60 thus includes a multitude of cross-linked 62 particles distributed throughout the thickness of the contact layer 60.

The surface of the contact layer 60 is thus defined by a multitude of projections 64. The projections 64 generally define the contact area between the contact layer 60 and the panel. The projections 64 may have a density of approximately 50 to approximately 300 projections per square inch. The projections 64 extend from an adjacent portion of the surface of the contact layer 60 by a distance of approximately 5 microns to approximately 100 microns.

The substrate 40, the contact layer 60 and the cross-linked particles 62 are selected such that upon a compressive force against the contact layer and projecting particles, the particles are not substantially displaced into the contact layer or the underlying substrate. That is, the cross-linked particles 62 maintain the area of contact between the weatherseal 20 and the panel and the area of contact is not significantly increased.

The elevational profile of a projection 64 is substantially determined by the shape of the cross-linked particles 62 and the viscosity of the contact layer 60. The projections 64 are generally tapered or pyramidal. However, the particles 62 may have any of a variety of shapes including, but not limited to spherical, faceted or irregular. The projections 64 have a sufficient cross sectional area to substantially preclude deformation or fracture upon operable loading of the panel against the weatherseal 20.

The projections may be formed as the particles are encapsulated by the contact layer 60. That is, a convex bulge in the contact layer 60 is formed by the underlying particle 62. In addition, the projection 64 may be formed by an exposed surface of the

particle. That is, the particle 62 is partially embedded in the contact layer 60, and a portion of the particle is exposed as the projection 64.

It has been found that the present weatherseal 20 also reduces noise generation resulting from relative motion between the panel and the weatherseal as compared to a similar seal formed without the particles. The noise reduction occurs for dry as well as wet conditions. Thus, squeak, chatter and chirp are reduced.

Method of Manufacture

Generally, the present weatherseal 20 is formed by extruding the contact layer 60 onto the desired locations of the substrate 40. The substrate 40 may be previously formed or coextruded with the contact layer 60. It is understood that if heat bonding is desired and the substrate 40 has been previously formed and cooled, that preheating may be required prior to extruding the contact layer 60.

The cross linked polyethylene particles 64 are mixed in a thermoplastic resin to form a contact layer mixture. The contact layer mixture is extruded or coextruded with or onto the substrate 40. The weatherseal 20 is then cooled. The contact layer 60 may be located along the entire longitudinal dimension of substrate 40. Alternatively, the die may be controlled to locate the contact layer 60 along selected longitudinal sections or lateral portions of the substrate profile.

While a preferred embodiment of the invention has been shown and described with particularity, it will be appreciated that various changes and modifications may suggest themselves to one having ordinary skill in the art upon being apprised of the present invention. It is intended to encompass all such changes and modifications as fall within the scope and spirit of the appended claims.

In the Claims:

1. A weatherseal for releasably contacting a panel, comprising:

(a) an elastomeric substrate; and

(b) a contact layer on a portion of the substrate, the contact layer having a multitude of cross-linked particles embedded in a thermoplastic to form a contact surface having a multitude of projections.

2. The weatherseal of Claim 1, wherein the cross-linked particles are a cross-linked polymer.

3. The weatherseal of Claim 1, wherein the substrate includes one of a thermoset, a thermoplastic and a thermoplastic elastomer.

4. The weatherseal of Claim 1, wherein the cross-linked particles are cross-linked ultra high molecular weight polyethylene.

5. The weatherseal of Claim 4, wherein the cross-linked ultra high molecular weight polyethylene is radiation cross-linked.

6. The weatherseal of Claim 1, further comprising a reinforcing member having a greater rigidity than the elastomeric substrate.

7. A method of forming a weatherseal for releasably contacting a panel, comprising:

(a) mixing cross-linked particles in a thermoplastic resin to form a mixture; and

(b) applying the mixture to an elastomeric substrate.

8. The method of Claim 7, wherein applying the mixture to the elastomeric substrate includes extruding the mixture.

9. The method of Claim 7, further comprising employing cross linked ultra high molecular weight polyethylene as the cross-linked particles.

10. The method of Claim 9, further comprising radiation cross linking the ultra high molecular weight polyethylene particles.

11. The method of Claim 10, further comprising radiation cross linking the ultra high molecular weight polyethylene particles prior to forming the mixture.

12. The method of Claim 7, further comprising forming the substrate of at least one of a thermoplastic, a thermosetting and a thermoplastic elastomer material.

13. A weatherseal for releasably engaging a panel, comprising:

(a) a substrate;

(b) a thermoplastic contact layer on at least a portion of the substrate; and

(c) a multitude of cross-linked particles embedded in the thermoplastic contact layer to define a sufficient multitude of projections to reduce a coefficient of friction between the weatherseal and the panel.

14. The weatherseal of Claim 13, wherein the substrate is one of a thermoplastic, thermoplastic elastomer and thermosetting material.

15. A weatherseal for releaseably engaging a panel, comprising:

(a) a substrate;

(b) a thermoplastic contact layer on at least a portion of the substrate; and

(c) a sufficient number of cross-linked particles distributed throughout and bonded to the contact layer to substantially preclude noise generation upon relative motion between the weatherseal and the panel.

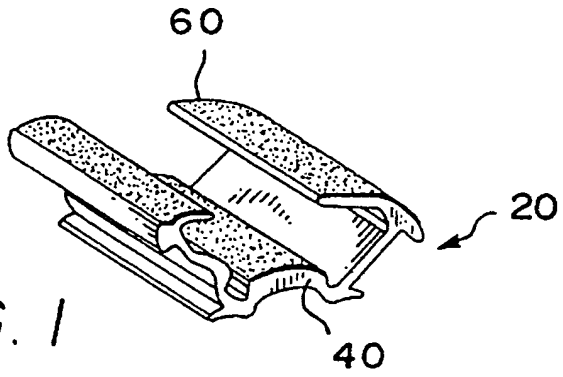

FIG. 1

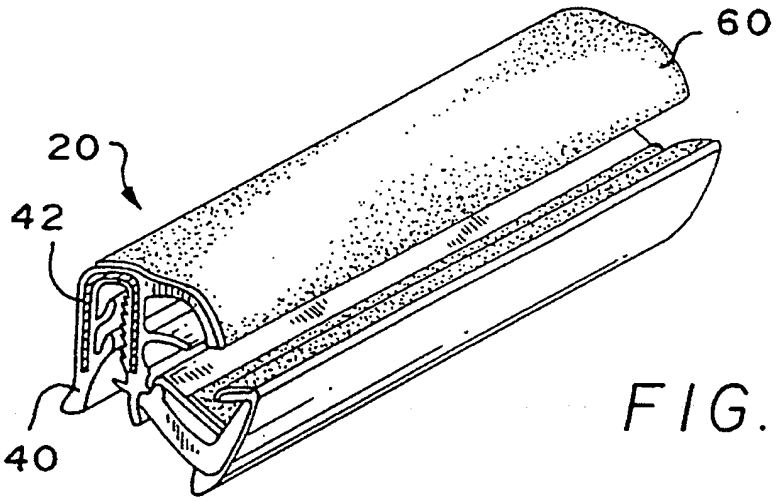

FIG. 2

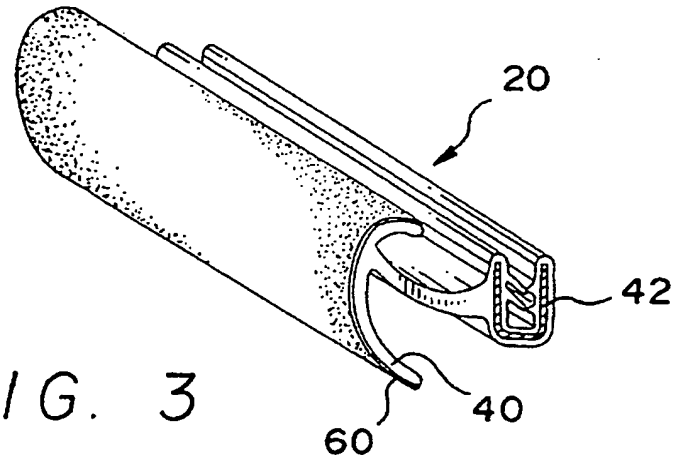

FIG. 3

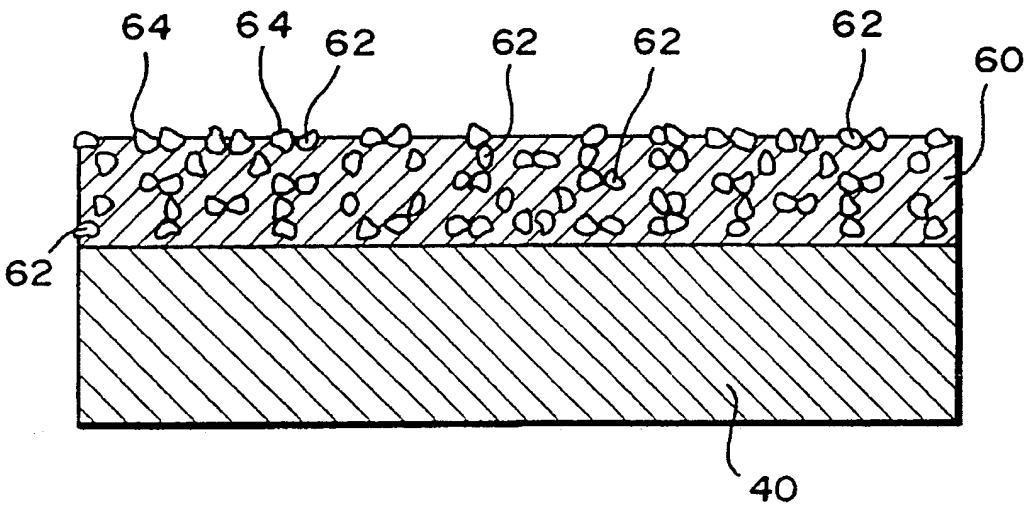

FIG. 4

INTERNATIONAL SEARCH REPORT

Inter inal Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B60J10/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B60J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category '	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 1998, no. 10, 31 August 1998 (1998-08-31) & JP 10 119668 A (TOKIWA CHEM KOGYO KK;SYST TECHNICAL:KK), 12 May 1998 (1998-05-12) abstract ---	1,7,13, 15
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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
1 November 1999	08/11/1999

Name and mailing address of the ISA	Authorized officer
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